

Compare the Effect of 50% Ramp-Up And 100% Ramp-Up Faradic Stimulation in Patients with Non-Specific Trapezius Spasm - A Randomised Clinical Trial

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Abstract

Relevance: Neck pain is one of the most common conditions leading to functional disabilities seen worldwide. There are different methods to manage neck pain, conservatively. Physiotherapy treatment as conservative management involves reduction of pain, increasing the ROM, and functional ability by various approaches like exercise therapy, electrotherapy and manual therapy techniques. Various studies have proven that faradic stimulation along with conventional treatment gives significant beneficial effects. Hence this study was undertaken to compare the effect of 50% and 100% ramp-up Faradic Stimulation in patients with non-specific trapezius spasm.

Participants: 36 subjects diagnosed with trapezius spasm were recruited from out-patient dept. of physiotherapy of KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

Method: Subjects were randomly allocated into 2 groups namely group A (n=18) who received 50% Ramp-up Faradic Stimulation along with cryotherapy as conventional treatment and group B (n=18) who received 100% Ramp-up Faradic Stimulation with conventional therapy same as in Group A for 6 days. The outcome measures were Vas for pain and cervical range of motion using tape method.

Analysis: Within group and between groups analysis after intervention was done to assess changes using Paired sample t-test.

Result: For VAS parameter Group A is better than group B with $t=5.178$ and $p=0.000^*$. For ROM parameter there was no evident significant change seen between both the groups with the value of $t=0.274$ and $p=0.770$.

Conclusion: 50% ramp up faradic stimulation is better than 100% ramp up faradic stimulation in patients with non-specific trapezius spasm according to the statistical analysis obtained.

Keywords: Trapezius spasm, faradic current, strong surge faradism,

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I. Introduction

Trapezius is a large muscle that covers the posterior aspect of neck and the back region. The muscle has 5 origins that is from the superior nuchal line, external occipital protuberance, ligamentum nuchae and spinous process of C1 through T12 vertebra. The muscle is divided into 3 fibers i.e upper, middle and lower fibers that insert on the lateral third of clavicle, scapular spine and the base of the spinous process.^[1] Muscle spasm is a state in which the muscle contracts involuntarily or become taut causing pain and tender points which can cause restricted movements. Muscle spasms can occur anywhere in the body but are frequently seen in the muscles of the neck, trapezius being the most common. Neck pain due to muscle spasm is a frequent complaint by the patients commonly caused due to attaining abnormal and static postures for extended duration of time, lowering the threshold of motor unit activation, decreased blood flow to the muscle and retention of calcium ions and other changes in the muscle properties. These are the main reasons as to which the pain does not reduce with rest and increases on attaining static positions.^[2]

The approximate prevalence noted from the studies conducted in previous years is between 10.4% and 21.3%. In general population prevalence ranges from 0.4% to 86.8% (mean=23.1%), point prevalence ranges from 0.4% to 41.5% (mean=14.4%) and prevalence over one year ranges from 4.8% to 79.5% (mean=25.8%).^[3] Numerous physiotherapy interventions are used in the treatment of trapezius spasm. Electrotherapeutic techniques such as cryotherapy, TENS and microwave diathermy are also frequently used. Therapeutic faradic stimulation is another modality that can be used in management of trapezius spasm. Faradic current is an

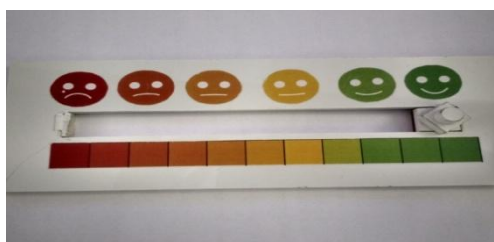
interrupted direct current of short duration. It is a low frequency current with pulsed duration between 0.1 to 1.0 units. It has various surges and it brings about tetanic like contractions in muscles followed by relaxation. The stimulation produces similar effects to that of voluntary contractions.^[4] Current produced by therapeutic stimulator is generally surged rather than altered haphazardly. Surging is gradual rise or fall in the intensity of series of pulses. Ramping up means the amplification of consecutive pulses. In order to prevent startle reaction, the duration of ramping should be minimum 0.5 seconds. This is preceded by either ramping down or termination of the current.^[5] The current is applied at either 2-5 seconds surge continuously or 6-30 surges per minute. The rest period should be at least two times longer than the pulsed duration. Pulsed duration is 0.1 msec with 70 Hz frequency and 1.0 msec with 50 Hz frequency.^[4] Surging of faradic stimulation produces various beneficial effects not only on neuromuscular but also on the musculoskeletal properties. It leads to elevated blood flow to the muscles as well as rapid removal of waste metabolites from the body therefore enhancing the chemical and physiological properties of the muscle.^[6] It helps to enhance the contractile property of the muscle. There is increased supply of nutrients as well as oxygen to the muscle being treated. It also prevents adhesion in the muscle by preventing the organization of lymph within the muscle tissue.

In cases of adhesions, it helps to break the adhesions by increasing the contraction force of the muscle.^[6] It also prevents wasting of muscle followed by injury and also aids to normalize the bulk in case of muscle wasting.^[6] Faradic currents are widely used in muscle re-education. Various studies have been conducted to study the effect of faradic stimulation in patients with muscle spasm and myofascial trigger points but the surge is not determined. There is paucity of evidence showing therapeutic effects of 50% and 100% strong surge faradism on trapezius muscle spasm. Hence this study has been planned to determine the optimal surge required to treat non-specific trapezius spasm.

II. Materials And Methods

Participants: 36 subjects with trapezius spasm were recruited in the study as per the following inclusion criteria: 1) Participants with non-specific trapezius muscle spasm, 2) Participants with either gender with age group between 18-40 years 3) Participants volunteering to participate in the study and 4) Participants screened according to Short-form McGill Pain Questionnaire. Subjects were excluded if they had 1) Recent fractures to avoid unnecessary painful motions, 2) Prescribed with medications within 48 hours of the session that can alter the outcome of the study,^[7] 3) Specific neck pathology, 4) any neurological condition and 5) any disc pathology. Informed consent was taken from the participant before enrolment in the study. Study was carried out in KLES Dr Prabhakar Kore Hospital and Medical Research Centre, after approval of Institutional Ethical Committee, KAHER Institute of Physiotherapy, Belagavi.

Outcome measures: 1) **Visual analogue scale using VAS-O METER:** VAS is a one dimensional measure of pain potency consisting of a scale 10 cm, 0 being no pain and 10 being maximum intensity of pain. It is a widely accepted scale with a reliability of $r=0.94$, $p<0.001$ in educated population and $r=0.71$, $p<0.001$ in uneducated population.^[8]



2) **Cervical Range Of Motion:** Range of motion can be assessed either by tape method or by goniometry. The intra-therapist reliability coefficients (r) for tape Method being 0.26 ($p>0.05$) to 0.88 ($p<0.001$) and of Myrin® Goniometer 0.31 ($p>0.05$) to 0.86 ($p<0.001$). The inter-tester reliability coefficient seen throughout the sessions showed that Tape Method has ranges falling from 0.30 ($p>0.05$) to 0.92 ($p<0.001$) and Myrin® Goniometer measure was 0.26 ($p>0.05$) to 0.84 ($p<0.001$).^[9]

Intervention: After briefing the participants informed consent was obtained. The subjects were randomly allocated into 2 groups by envelope method. Group A: 50% Ramp up faradic stimulation followed by cryotherapy for 20 minutes. Group B: 100% Ramp up Faradic stimulation followed by cryotherapy for 20 minutes.



		Mean difference	t	p
VAS	Group A	4.15 ±0.3477	19.127	0.009*
	Group B	3.65 ±±0.2166	13.266	0.001*
ROM	Group A	2.3945 ±0.1822	14.56	0.008*
	Group B	2.4111 ±0.15538	13.60	0.026*

III. Results

The results were analysed in terms of reduction in pain, and increase in ROM. Statistical analysis was done using SPSS version 23. Statistical measures such as mean, standard deviation and test of significance (paired “t” tests) were used to analyse the data.

Demographic profile: Each group had 18 participants. The mean age of Group A was 24.44± 5.33 years and the mean age of Group B was 24.61± 4.74 years. Group A included 15 females 3 males and group B had 4 males and 14 females. Group A had 9 participants each in right as well as left side involvement whereas group B had 11 right and 7 left side affected subjects.

Table no.1: Demographic profile among Group A and Group B

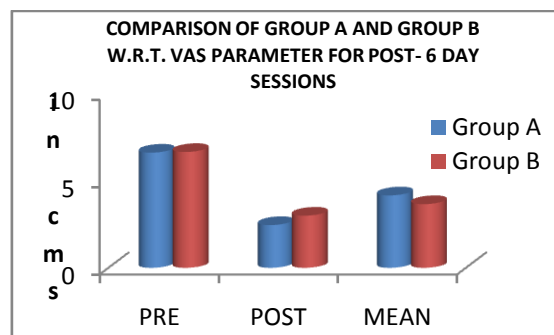
GRP	NO	MEAN AGE	GENDER		SIDE INVOLVED	
			Male	Female	RIG HT	LEF T
A	18	24.44± 5.33	3	15	9	9
B	18	24.61± 4.74	4	14	11	7

Table no.2: intra group comparison of outcome measure

Outcome parameters:1.VAS parameter:

In group A mean difference seen was of 4.15±0.3477cm with t value=19.127 and p value=0.009*and in group B, mean difference seen was of 3.65±0.2166cm with t value=13.266 and p value=0.001*. (Table no.2, graph no.1) When comparing between both the groups, Group A showed a mean difference of 4.15±0.3477cm and Group B showed mean difference of 3.65±0.2166 cm, which shows that , Group A is better than group B with t=5.178 and p=0.000* showing statistical significance. (Table 3)

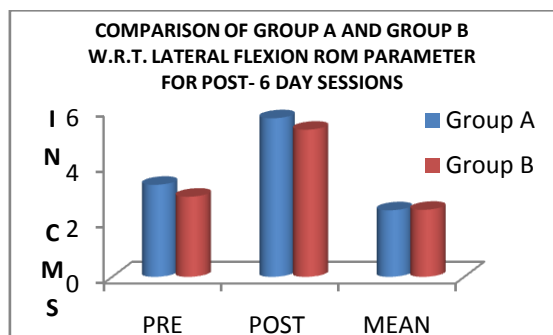
Graph no.1: Group A and group B comparison for VAS post 6 sessions



2. ROM parameter: The mean difference of group A was 2.3945±0.1822cm with t value= 14.56 and p value = 0.008* and that of group B was 2.411 ±0.15538cm with t value=13.60 and p value=0.026. (Table no.2, graph

no.2) In Inter group comparison between both the groups Group A showed a mean difference of 2.3945 ± 0.1822 cm and Group B showed a mean difference of 2.411 ± 0.15538 , which shows there was no evident significant change seen between both the groups with the value of $t=0.274$ and $p=0.770$. (Table no.3)

Graph no.2: Group A and group B comparison for ROM post 6 sessions



Tableno.3: intergroup comparison of outcome measure

		t	p
Group A Vs Group B	VAS	5.178	0.000*
	ROM	0.274	0.770

IV. Discussion

There is increasing interest in treatments for non-specific trapezius spasm causing neck pain and decreased functional capabilities. Various physiotherapeutic interventions are available for the management of trapezius spasm. One of the effective means of treatment is faradic stimulation. Hence the aim of the present randomized clinical trial was to compare the effects of 50% ramp-up and 100% ramp-up faradic stimulation in patients with non-specific trapezius spasm. In present study, the Age taken into consideration was 18-40 years. Subjects with non-specific trapezius spasm pain who fulfilled the criteria of Short form McGill pain questionnaire were enrolled for the study. As there was significant research done for the prevalence of non-specific neck pain up to the age group of 40 years; hence the age group selected for present study was 18-40 years. Hoy and Protani reported the prevalence in general population ranges from 0.4 % to 86.8% (mean = 23.1%). Point prevalence ranges from 0.4 % to 41.5 % (mean = 14.4 %) and prevalence over one year ranges from 4.8% to 79.5% (mean = 25.8%).^[3] Also neck pain is more common in women as compared to men in older age. According to Guez, acute neck pain was more common in women of working age with *p value* ($p=0.001$). 19 % of the rest of the population showed signs of chronic pain from which 22(20-23)% were women and 16(14-17)% were men with odds ratio of 0.66 and CI = 0.58-0.76.^[10] In this study, when statistical analysis was done for between the group comparison, Group A was better on mean value which was more than group B mean value with $t=5.178$ and $p=0.000^*$ showing statistical significance in reduction of pain. According to a study done by Reddy to compare the effects of surged faradic current and manual pressure release on myofascial trigger point of upper trapezius it was found that both the groups were beneficial for the condition in terms of pain reduction and increase in motion.^[11]

The pain was mainly due to attaining abnormal and static positions, lowering the threshold of motor unit activation, decreased blood flow to the muscle and retention of calcium ions.^[2] According to Froster and Palastanga faradic stimulation brings about similar effects of normal voluntary contractions, which causes increased in metabolism and increased removal of waste products that could lead to reduction in pain.^[4] In the present study, when statistical analysis was done for lateral flexion ROM between the group comparison, there was no evident significant change seen between both the groups with the value of $t=0.274$ and $p=0.770$. The slight increase in the range of motion could be because of reduction of pain and spasm. Surging of faradic stimulation produces various beneficial effects. It helps to restore the normal muscle tone. It leads to elevated blood flow to the muscles as well as rapid removal of waste metabolites from the body therefore enhancing the chemical and physiological properties of the muscle. There is increased supply of nutrients as well as oxygen to the muscle being treated. It also prevents adhesion in the muscle by preventing the organization of lymph within the muscle tissue. In cases of adhesions, it helps to break the adhesions by increasing the contraction force of the muscle. It also prevents wasting of muscle followed by injury and also aids to normalize the bulk in case of

muscle wasting.^[6] But the present study showed changes in range of motion which was significant for within the group comparison but there was no evident change noticed when between the group comparison was done.

In the present study the outcome measure was cervical lateral flexion range of motion which was measured with the help of Tape Measure Method respectively. For Tape Measure Method reliability ranges from 0.30 ($p>0.05$) to 0.92 ($p>0.001$).^[8]We had also used VAS measured with the help of VAS-O-METER as outcome measure for pain. The reliability of VAS is $r=0.94$ with $p<0.99$ in educated population; $r=0.71$ $p<0.001$ in uneducated population and validity is 0.99.^[12] In this study, pain measurement tool was developed for the project based on VAS called as VAS-O-METER.

In this study, both groups were given their allotted ramp-up faradic stimulation with cryotherapy being the conventional therapy which was given after the faradic stimulation was given. Various studies support the application of cryotherapy in reduction of spasm and pain. One such study was conducted on effects of early cryotherapy in experimental skeletal muscle injury which showed significant changes such as reduction in hematoma size activation of satellite cells.^[13] The above results have shown effective changes in pain and cervical range of motion parameter when compared between the Group A and Group B. Both the group showed results but Group A showed significant changes in pain parameter and cervical range of motion (lateral flexion). Both Group A and Group B are effective for treatment but group A (50% Ramp-Up) brought about more evident results.

Limitations: Only two different surges (50% and 100%) were used in the study

Recommendations for Future Study: This study can be repeated by using a different target population, with a different age group and different surges which could be added to the literature on use Faradic Stimulation.

V. Conclusion

The study concluded that 50% ramp up faradic stimulation is better than 100% ramp up faradic stimulation in patients with non-specific trapezius spasm according to the statistical analysis obtained.

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Conflict of interest: None

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